

ABSTRAK

KONTROL STRUKTUR GEOLOGI TERHADAP ALTERASI DAN MINERALISASI DI TIMBURU: INDIKASI SISTEM *INTRUSION-RELATED GOLD DEPOSIT*

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Daerah Timburu, Kabupaten Kotabaru, Kalimantan Selatan, merupakan wilayah yang dipengaruhi aktivitas magmatisme dan deformasi tektonik yang berpotensi membentuk sistem hidrotermal pembawa mineralisasi emas. Struktur geologi berperan penting sebagai jalur migrasi fluida hidrotermal yang mengontrol perkembangan alterasi dan mineralisasi. Namun demikian, hubungan antara geologi daerah, alterasi, mineralisasi, dan kontrol struktur geologi di daerah Timburu masih belum dipahami secara menyeluruh. Oleh karena itu, penelitian ini dilakukan untuk mengkaji kontrol struktur geologi terhadap alterasi dan mineralisasi serta mengevaluasi indikasi sistem *Intrusion-Related Gold Deposit* (IRGD) di daerah penelitian. Metode penelitian meliputi pemetaan geologi permukaan, pengamatan alterasi dan mineralisasi, analisis struktur geologi, serta pengambilan sampel batuan. Analisis laboratorium dilakukan menggunakan petrografi, mineragrafi, analisis ASD (*Analytical Spectral Devices*), dan analisis geokimia Au–Ag dengan metode *aqua regia digestion-Atomic Absorption Spectroscopy* (AAS). Analisis stereografi digunakan untuk menentukan orientasi dan kinematika struktur geologi pada daerah penelitian. Seluruh data diintegrasikan untuk menyusun interpretasi geologi dan model kontrol struktur terhadap mineralisasi. Berdasarkan hasil penelitian, daerah penelitian tersusun oleh satuan peridotit, gabro, serpentinit, dan diorit porfiri yang dipengaruhi oleh sesar mendatar, *shear zone*, dan sistem rekahan. Alterasi yang berkembang meliputi alterasi silika + hematit, silika + illit + jarosit + hematit, illite/smektite + kaolinite + jarosit + goetit, dan klorit. Mineralisasi dijumpai pada urat kuarsa kompresi dan urat tensi yang mengandung mineral sulfida berupa pirit, galena, sfalerit, dan kalkopirit, dengan kadar Au berkisar <0,02 ppm hingga 2,45 ppm dan Ag berkisar <2 ppm hingga 8,289 ppm. Struktur geologi berperan sebagai pengontrol utama pembentukan urat, jalur migrasi fluida, serta distribusi alterasi dan mineralisasi. Karakteristik alterasi yang terbatas di sekitar urat kuarsa dengan geometri *sheeted veins*, asosiasi mineral sulfida yang relatif rendah, serta hubungan spasial dengan intrusi diorit porfiri mengindikasikan keterkaitan sistem mineralisasi di daerah penelitian dengan model *Intrusion-Related Gold Deposit* (IRGD). Namun demikian, konfirmasi lebih lanjut masih memerlukan data pendukung berupa geokimia unsur jejak, studi inklusi fluida, dan karakterisasi geokimia yang lebih rinci.

Kata kunci: alterasi, *intrusion-related gold deposit*, mineralisasi, struktur geologi, Timburu

ABSTRACT

Structural Controls on Alteration and Mineralization in the Timburu Area: Indications of an Intrusion-Related Gold Deposit System

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The Timburu area in Kotabaru Regency, South Kalimantan, is influenced by magmatic activity and tectonic deformation and has the potential to host hydrothermal systems that host gold mineralization. Geological structures play a crucial role as migration pathways for hydrothermal fluids, controlling the development of alteration and mineralization. However, the relationship between regional geology, alteration, mineralization, and geological structural control in the Timburu area is not yet fully understood. Therefore, this study was conducted to examine the geological structural control on alteration and mineralization and to evaluate indications of an Intrusion-Related Gold Deposit (IRGD) system in the study area. Research methods included surface geological mapping, observation of alteration and mineralization, analysis of geological structures, and rock sampling. Laboratory analyses were performed using petrography, mineralogy, ASD (Analytical Spectral Devices) analysis, and Au–Ag geochemical analysis via aqua regia digestion-Atomic Absorption Spectroscopy (AAS). Stereographic analysis was used to determine the orientation and kinematics of geological structures in the study area. All data were integrated to develop a geological interpretation and a structural control model for mineralization. Based on the research results, the study area consists of peridotite, gabbro, serpentinite, and porphyry diorite units influenced by strike-slip faults, shear zones, and fracture systems. The alteration types observed include silica + hematite, silica + illite + jarosite + hematite, illite/smectite + kaolinite + jarosite + goethite, and chlorite. Mineralization is found in compressional and tensional quartz veins containing sulfide minerals such as pyrite, galena, sphalerite, and chalcopyrite, with Au grades ranging from <0.02 ppm to 2.45 ppm and Ag grades ranging from <2 ppm to 8.289 ppm. Geological structures serve as the primary controls on vein formation, fluid migration pathways, and the distribution of alteration and mineralization. The characteristics of alteration, which are confined to the vicinity of quartz veins with a sheeted vein geometry, a relatively low association of sulfide minerals, and a spatial relationship with porphyry diorite intrusions, indicate that the mineralization system in the study area is consistent with the Intrusion-Related Gold Deposit (IRGD) model. However, further confirmation still requires supporting data in the form of trace element geochemistry, fluid inclusion studies, and more detailed geochemical characterization.

Keywords: *alteration, intrusion-related gold deposit, mineralization, geological structure, Timburu*